No. 830,767. PATENTED SEPT. 11, 1906.

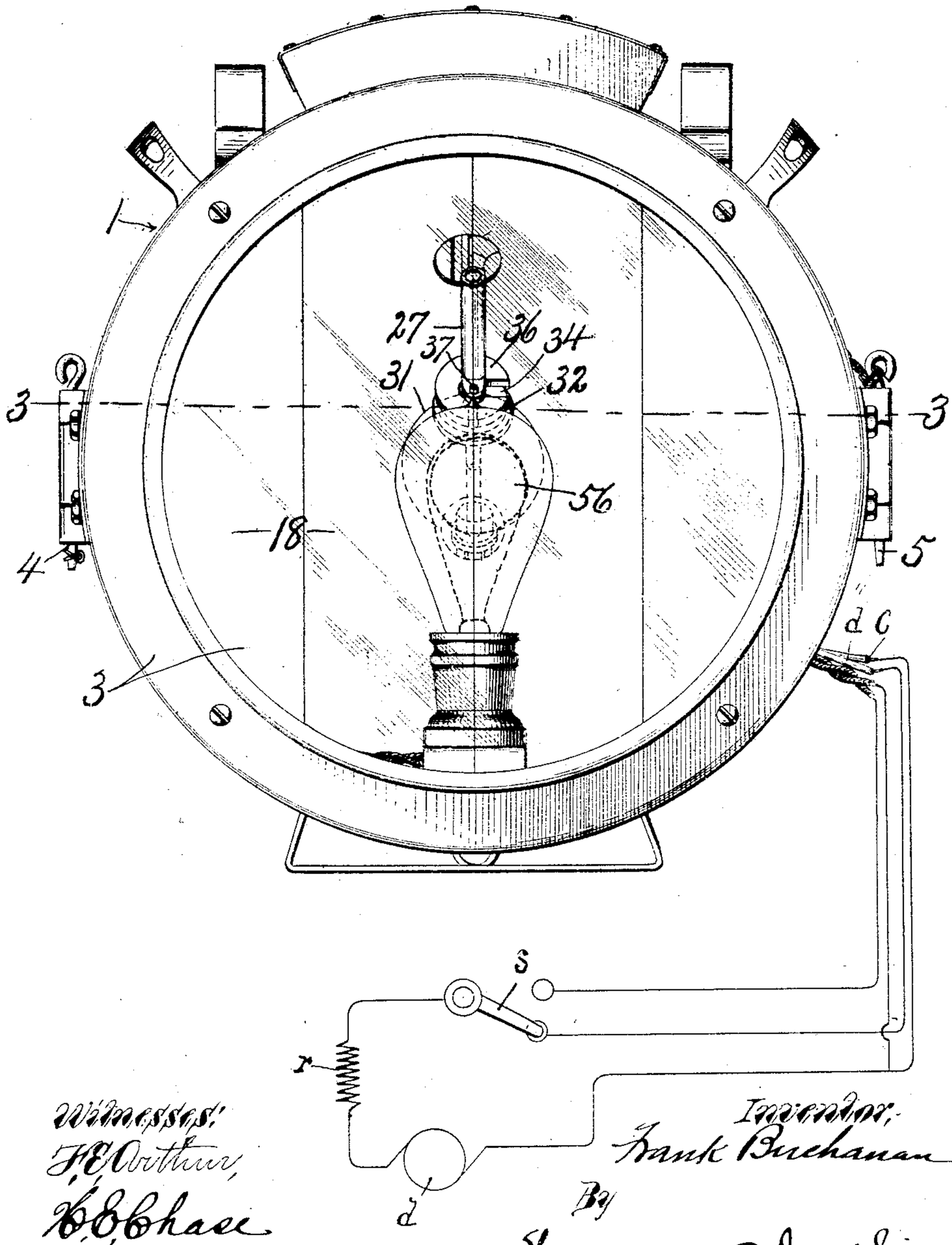
F. BUCHANAN.

HEADLIGHT.

APPLICATION FILED OCT. 26, 1903.

3 SHEETS—SHEET 1.

Fig. 1



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3 SHEETS—SHEET 2.

Fig. 2.

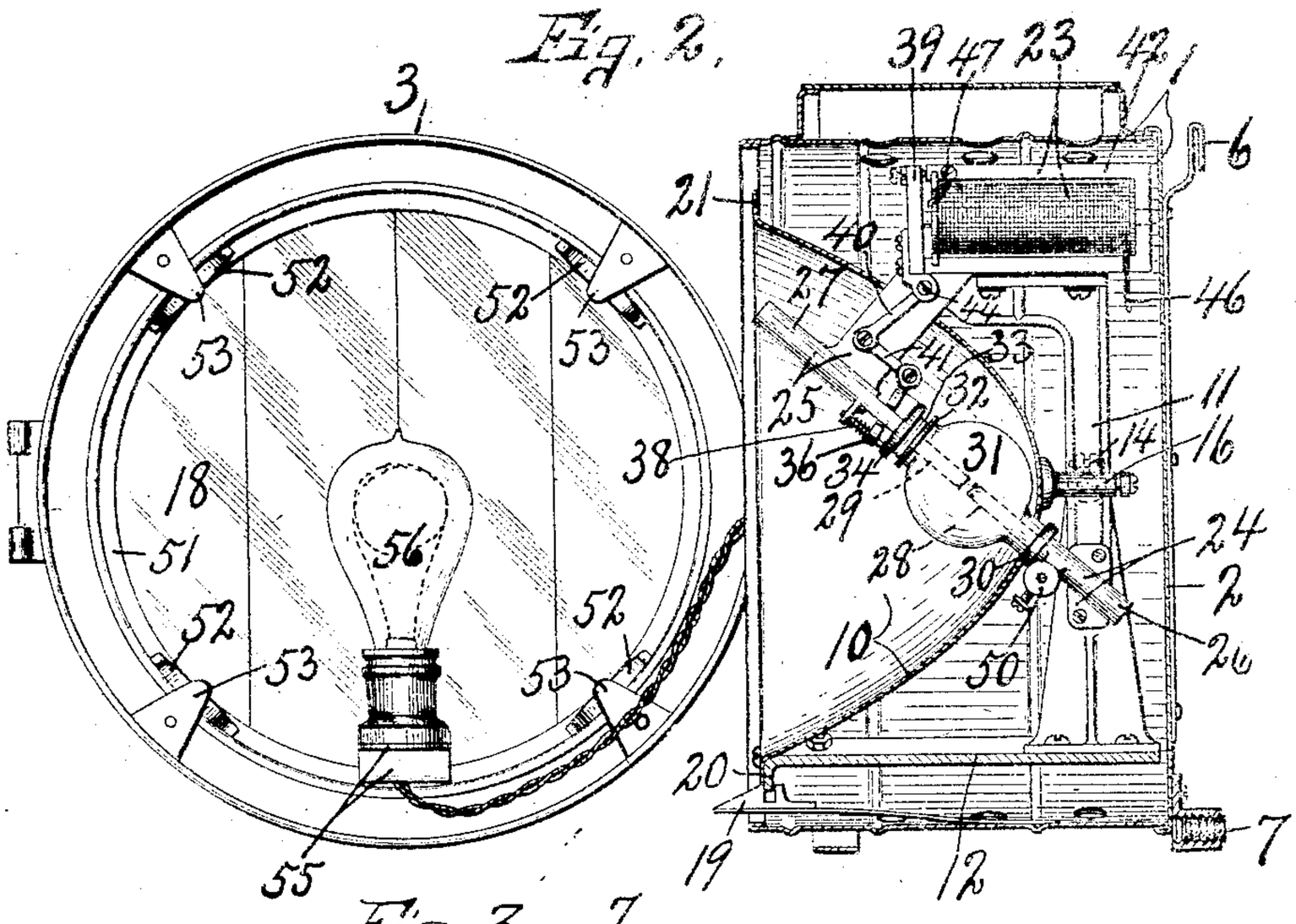
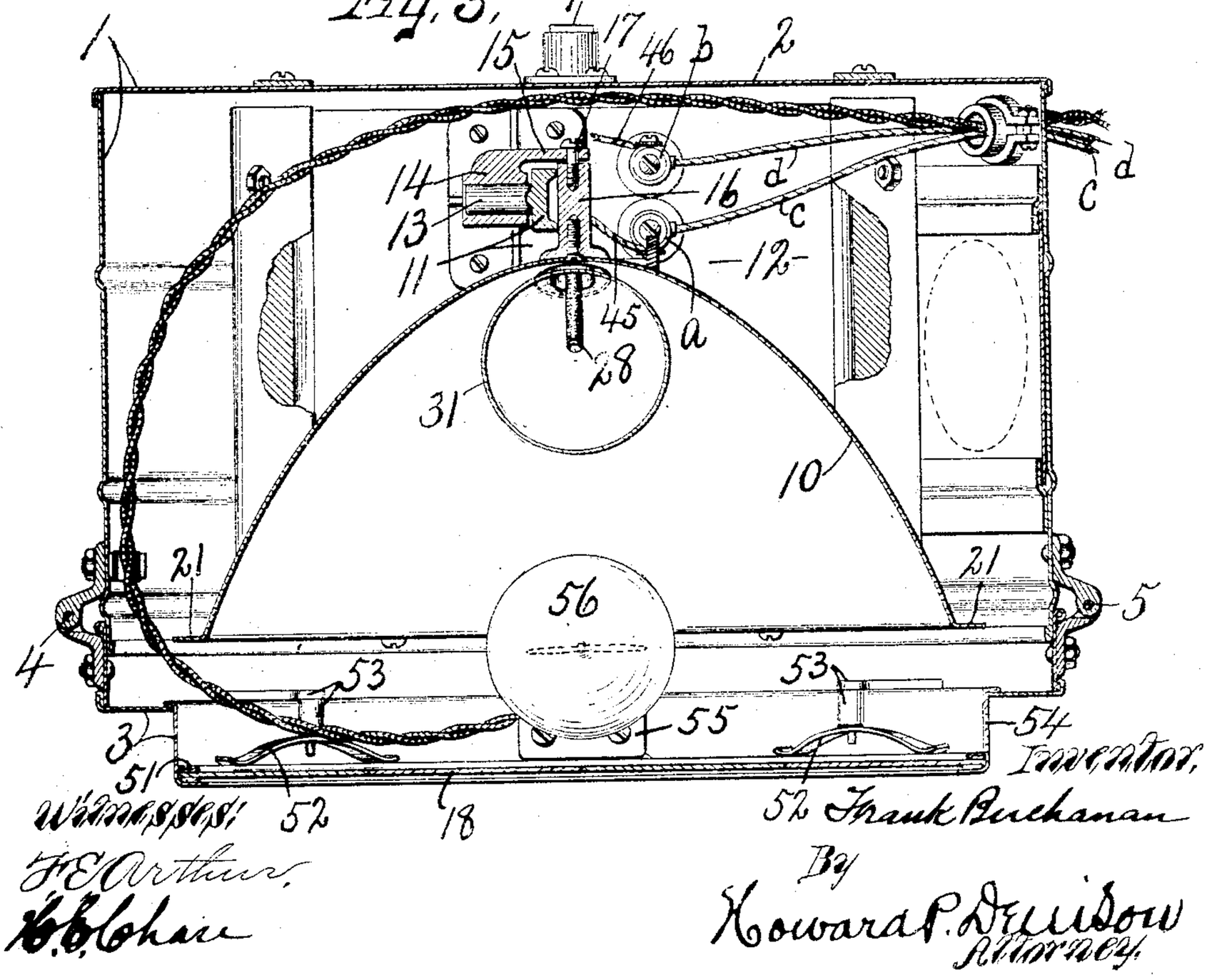


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

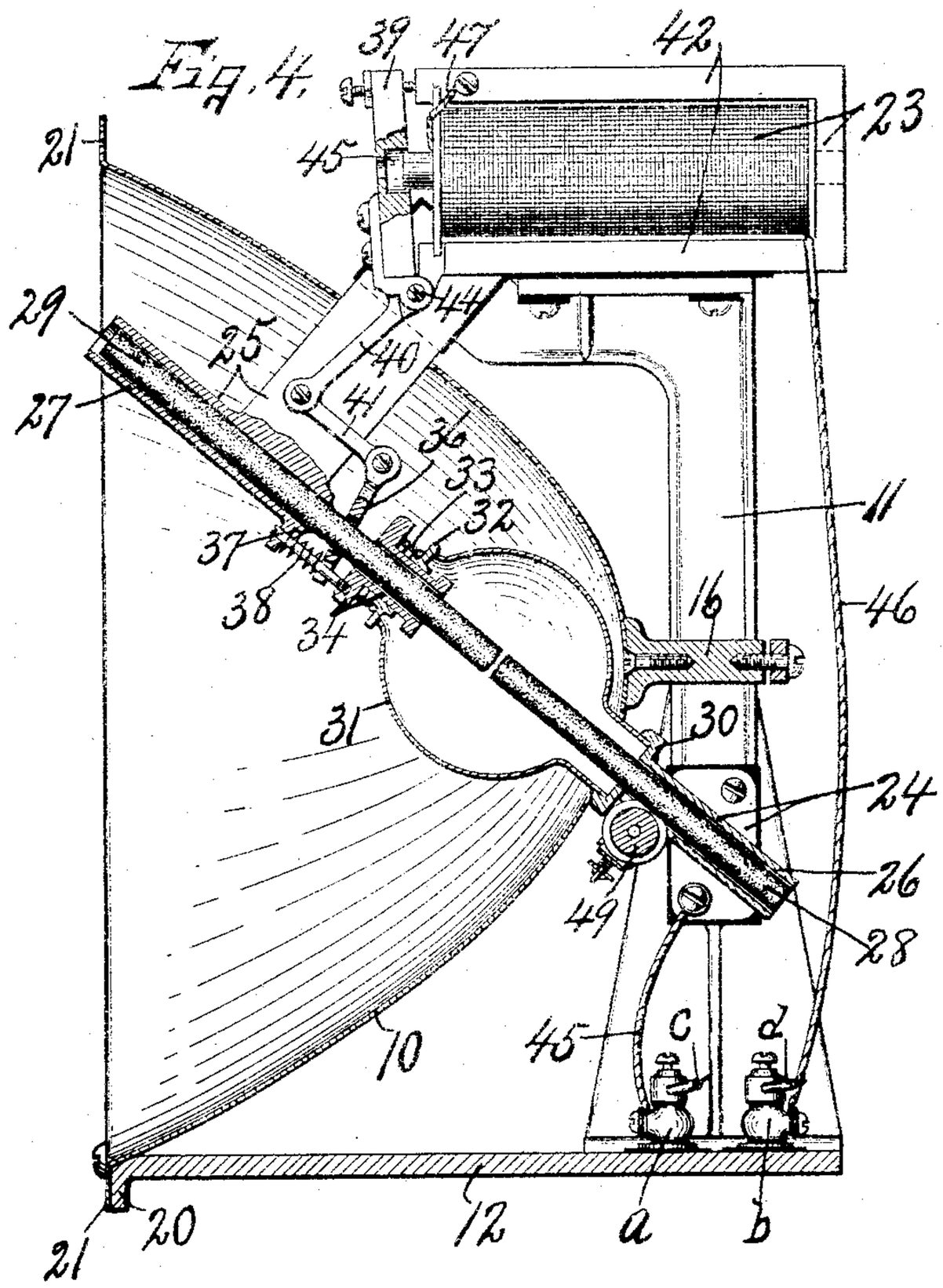


Fig. 5

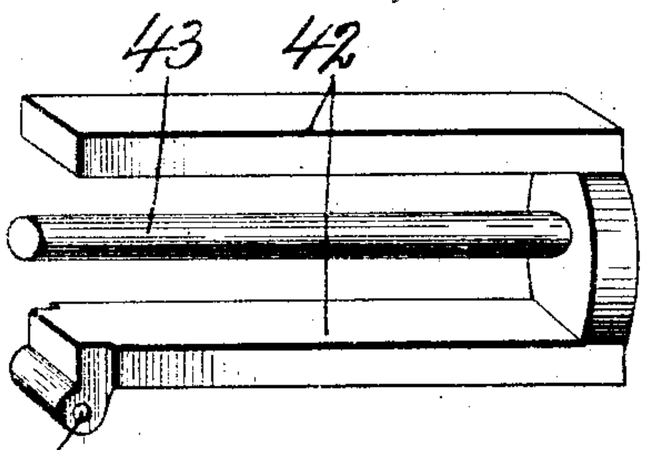
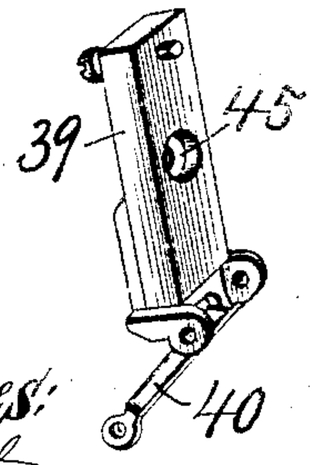


Fig. 6.



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UNITED STATES PATENT OFFICE.

FRANK BUCHANAN, OF DAYTON, OHIO.

HEADLIGHT.

No. 830,767. Specification of Letters Patent. Patented Sept. 11, 1906.

Application filed October 26, 1903. Serial No. 178,557.

To all whom it may concern:

Be it known that I, FRANK BUCHANAN, of Dayton, in the county of Montgomery, in the State of Ohio, have invented new and useful Improvements in Headlights, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to improvements in headlights in which two electric lamps are located in the focal axis of the parabolic reflector, one in front of the other. These headlights are especially adapted for use on the cars of electric-railway systems of large cities in which many of the lines extend a considerable distance into the suburbs and rural districts, and it is found desirable to use lights of different degrees of intensity, the stronger light being used while the car is traveling through the suburbs and rural districts, and the weaker light is brought into use when the car is passing through the streets of the more congested parts of the city.

One of the reasons for using the weaker lights in the cities is that the reflection of a strong light into the eyes of the pedestrians and drivers tends to obscure the vision and is frequently the direct cause of collisions and serious accidents. Another reason is that the streets of a city are usually well lighted at night, and therefore a mere signal-light on the car is all that is necessary. On the other hand, when the car is passing through the suburbs and into the rural districts, where they are usually run at a maximum speed, it becomes necessary to use a much stronger light to enable the motorman to see a considerable distance in advance of the car, so as to avoid accidents.

The primary object of this invention, therefore, is to locate both lights in the focal axis of the reflector, so that the reflected rays radiate uniformly in all directions from the focus of the reflector, and thereby produces a maximum light with a minimum power.

Another object is to locate the carbons of the arc-lamp at an angle with the focal axis of the reflector in such manner as to bring the crater of the upper carbon in position to face the focus, so that the arc-light is thrown across the focus of the reflector, whereby a much stronger light is produced with the same current than can be produced by having the carbons in a vertical position or perpendicular to the focal axis, in which position the arc-light is concentrated upon a portion of the reflector at one side, as beneath the focal axis or focus.

Other specific objects will appear in the subsequent description; but the purpose of the various features of novelty hereinafter described is to increase the general lighting and structural qualities of this class of apparatus, so as to render the headlight more useful for the purposes for which it is intended.

In the drawings, Figure 1 is a front face view of a headlight embodying the various improvements. Fig. 2 is a transverse vertical sectional view through the case and interior mechanism, showing the door open and in elevation. Fig. 3 is a horizontal sectional view taken on line 3 3, Fig. 1. Fig. 4 is an enlarged vertical sectional view through the arc-lamp and reflector, showing their supports and the carbon-feeding mechanism. Figs. 5 and 6 are perspective views of the detached magnet-yoke and its armature.

Similar reference characters indicate corresponding parts in all the views.

The greater part of the mechanism is inclosed within the cylindrical metal case 1, having a rear end wall 2, while its front end is open and is provided with a circular door or closure 3, which is hinged at 4 to one side of the case and is detachably locked at the other side by a pin 5, so that by simply withdrawing the pin the door may be swung upon its hinge 4 to the position seen in Fig. 2 or may be held in its closed position by the reinsertion of the pin 5, as seen in Figs. 1 and 3. This case is adapted to be detachably supported upon the front platform of the car and is therefore provided with a hook or bracket 6, which engages a suitable support upon the platform or dash, whereby the case is suspended. A buffer 7 is secured to the lower portion of the rear wall to engage the platform and hold the case a slight distance therefrom, said buffer being adjustable forwardly and rearwardly to tilt the case in which the reflector is located, and therefore the reflector may be tilted to throw the reflected rays of light up or down, as may be desired, such adjustment of the buffer being effected by means of a screw 8, Fig. 2. A parabolic reflector 10 is centrally mounted in the open end of the case with its apex extending rearwardly and is provided with a rearwardly-extending hub 16, which is adjustably secured to an upright arm or bracket

11 of a sliding support 12. This upright arm or bracket is formed with a laterally-projecting stud 13, upon which is clamped a split hub 14, having a laterally-projecting arm 15, and this arm receives a screw 17, which enters a threaded socket in the hub 16 and serves to partially support the reflector.

The screw-clamp 17 is substantially coincident with the axis of the reflector, which is circular in general outline, and therefore the reflector may be adjusted circumferentially to facilitate the assembling of the parts of the apparatus, and at the same time it is possible to tilt the reflector to properly adjust the same by simply loosening the clamp 14 upon the stud 13 and then rocking the reflector to the desired position, after which the clamp may be again firmly secured to the stud 13.

The support 12 preferably consists of a flat metal plate which is movable back and forth through the opening in the front of the case, but is held in its normal or innermost position, as seen in Figs. 1, 2, and 3, by means of a spring-catch 19, which engages a flange 20, depending from the front edge of the support 12.

The front end of the reflector is provided with an annular flange 21, the lower portion of which is secured by suitable fastening means, as screws, to the front edge of the support 12, which forms additional support for the reflector, and it is now apparent that the support 12, with the reflector mounted thereon, may be removed through the open end of the case when the door is swung backwardly to the position seen in Fig. 2, the object of this being to facilitate the work of repairs or the insertion of carbons in the arc-lamp, presently described.

The bracket 11 extends a considerable distance above the hub 16 at the rear of the reflector and carries at its upper end an electromagnet 23 of special construction, hereinafter described. This bracket also carries a pair of carbon-holders 24 and 25, both of which are insulated from the bracket and are provided with tubular guides 26 and 27, which are disposed, respectively, beneath and above the focal axis, of the reflector in alinement with each other, but at an angle with said focal axis, and receive suitable carbons 28 and 29, which are also disposed at the same angle with the focal axis of the reflector and meet so as to form an arc-light at or near the focus. The angle of inclination of these carbons is such that the upper carbon feeds readily by gravity and the crater at its lower end faces the apex of the reflector 1, so as to throw the arc-light at opposite sides of the focal axis, thereby establishing a stronger and more uniform reflection than would be possible with the carbons arranged vertically or perpendicular with the focal axis of the reflector. The upper end of the tube 26 is provided with a clamping-head 30 for receiving one end of a glass bulb 31, which incloses the adjacent ends of the carbons, the upper end of the bulb being engaged by a clamping-head 32, which is forced into engagement with the bulb by means of a spring 33, interposed between the clamping-head 32, and a tubular guide 34, which encircles the upper carbon and forms a continuation of the tubular guide 27. The upper end of the tubular section 34 is separated from the lower end of the tubular guide 27 for receiving a feeding-pawl 36. This pawl partially surrounds the upper carbon and is loosely mounted upon a stud 37 at one side of the carbon, and a spring 38 is interposed between the pawl 36 and adjacent end of the tubular guide 27 for yieldingly forcing the adjacent edge of the pawl downwardly. It is now apparent that by rocking the other end of the pawl upwardly the opposite walls of the opening, which receives the carbon, bite upon the carbon, and thereby elevate the same so as to separate its lower end from the upper end of the lower carbon for producing the arc-light. This upward feed of the upper carbon is preferably regulated by the electromagnet 23, which is connected in the arc-light circuit and is provided with an armature 39. When the arc-circuit is closed, the armature 39 is attracted and operates through the medium of an arm 40 and link 41, which are connected to the upper end of the pawl 36 to rock said pawl upwardly, and thereby separate the lower end of the carbon 29 from the lower carbon.

In order that the magnetic effect may be as strong as possible upon the armature, I provide a U-shape soft-iron bar 42 with a central core 43 for receiving the coil of the magnet between the arms of the U-shape bar 42. The armature 39 is pivoted at 44 to the front end of the lower arm of the bar and is provided with a recess 45 for receiving the end of the core 43. It will be apparent to any one skilled in the art that this construction of magnet is exceptionally powerful and operates more instantaneously than an ordinary winding upon a core, for the reason that the magnetic lines of force are set up in the arms of the bar 42, as well as in the core 43.

Mounted upon the support 12 are two binding-posts *a* and *b*, receiving the line-wires *c* and *d*, one of the binding-posts being electrically connected by a wire 45 to the lower-carbon holder 24, and the other binding-post is connected by a wire 46 to one end of the coil of the electromagnet, while the other end of the coil is connected by a wire 47 to one of the arms of the bar 42, from which the electric current is conducted to the tubular holder 25 and to the pawl 36, so that the circuit is completed through both carbons.

When the circuit is broken, the upper carbon feeds by gravity into contact with the lower carbon; but as soon as the circuit is

closed the armature 39 is instantly drawn rearwardly, thereby causing the pawl 36 to feed the upper carbon upwardly to separate the ends of the carbons for producing the arc-light. The lower carbon is fed upwardly by means of a rotary gripping-roller 49, which is operated by a handpiece 50 to properly adjust the lower carbon, so that the arc-light is substantially in the focal axis of the reflector.

The door 3 is provided with a glass front 18 of substantially the same diameter as the open end of the reflector 10, said glass being held in place by an annular clamping-ring 51 and clamping-springs 52, which are mounted upon studs 53 and engage the clamping-ring to force the same against the marginal edges of the glass, and it is apparent that by removing the studs or bracket 53 and springs 52 the ring 51 may be readily withdrawn for permitting the insertion or removal of the glass. This door is also formed with an annular flange 54, to the lower portion of which is secured a bracket 55, and upon this bracket is mounted an incandescent lamp 56. It is now apparent that the incandescent lamp is mounted upon the door and is movable therewith. The socket of the lamp is secured directly to the bracket 55 and projects upwardly therefrom, while the lamp itself is secured to the socket in the usual manner and projects upwardly therefrom, so that its bulb or larger end, in which the strongest light is concentrated, is located as nearly in the focal axis of the reflector as possible directly in front of the arc-lamp and centrally within the open end of the reflector.

The power-current is supplied to both lamps from a source of electric energy, as the dynamo *d*, and is controlled by a two-way switch *s*, Fig. 1, so that either of the lamps may be connected in the power-circuit independently of the other. The arc-lamp, which produces a light of greater intensity than the incandescent lamp, is usually placed in the circuit when the car is traveling in the suburbs or rural districts, while the incandescent lamp is usually placed in the circuit when the car is running through the congested parts of the city, and it is evident that by locating the incandescent light in the focal axis of the reflector a comparatively low candle-power may be used, because the reflected rays of light are of uniform intensity from the focus of the reflector. It is also apparent that by disposing the carbons at an angle, so that the crater faces the focus, the arc-light is concentrated at said focus and produces an intense and uniform reflection with the use of a minimum degree of current strength. I therefore believe that it is broadly new to mount the carbons at an angle with the focal axis of the reflector in the manner described and also to mount the incandescent lamp on the door in such manner that its light is in the focal axis of the reflector. It is also believed to be broadly new to provide a spring-tensioned clamping-head for the upper end of the arc-lamp globe or bulb, so as to be accessible from the open end of the reflector to permit the globe to be readily and easily removed or placed in position.

A resistance *r* is connected in the power-circuit between the dynamo *d* and switch *s*, so that both lamps have the same voltage and are controlled by the same two-point switch, which obviates the use of separate switches for the two lamp-circuits.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a headlight, the combination with an inclosing case having an open front and a movable closure therefor, of a sliding support guided in the case and movable through said opening, an upright bracket secured to the sliding support, a reflector mounted on the bracket and adjustable circumferentially thereon, means for clamping the reflector in its adjusted position, an arc-lamp carried by the bracket and having its carbons disposed in the same straight line at an angle with the axis of the reflector, and a spring-catch for holding the sliding frame in the inclosing case.

2. In a headlight, an inclosing case having an opening in its front side and a guide in its base extending from front to rear, a movable closure for the opening, an electric incandescent lamp mounted on the closure, a reflector-support slidable along said guides through the opening in the front of the case, a bracket rising from the rear end of the support, a catch engaging and holding the sliding support within the case, a reflector rotatably mounted on the bracket, means for clamping the reflector in its adjusted position, and an electric-arc lamp mounted in the reflector.

3. In a headlight, the combination with an inclosing case having an open front and a movable closure for said opening, of a sliding support guided in the case and movable through said opening, a bracket secured to and rising from the support, a vertically-tiltable reflector mounted on the bracket, means to hold the reflector in its tilted position, and an electric-arc lamp having carbons supported by said bracket and meeting within the reflector.

4. In a headlight, an inclosing case having a door forming one side of the casing, a sliding support guided in the casing and movable through its open side, a bracket secured to and rising from the support, a reflector mounted on the support and adjustable vertically, means to hold the reflector in its adjusted position, an electric-arc lamp having carbons mounted on the bracket, electrically-operated feeding mechanism for one of the carbons and including an electromagnet

mounted on the bracket, and an incandescent electric lamp mounted on the door in the focal axis of the reflector.

5. In a headlight, an inclosing case having an open front and a movable closure for the opening, a sliding support guided in the casing and movable through said opening, a bracket secured to and rising from the support, a reflector centrally supported upon the bracket and provided with openings, one below the center and the other above the center or focal axis of the reflector, an electric-arc lamp having one of its carbons passed through the lower opening in the reflector and its other carbon wholly within the reflector, a s pporting element for the lower carbon secured to the bracket, and an additional support for the upper carbon also secured to the bracket and extending through the upper opening in the reflector.

In witness whereof I have hereunto set my hand this 15th day of October, 1903.

FRANK BUCHANAN.

Witnesses:
H. E. CHASE,
MILDRED M. NOTT.